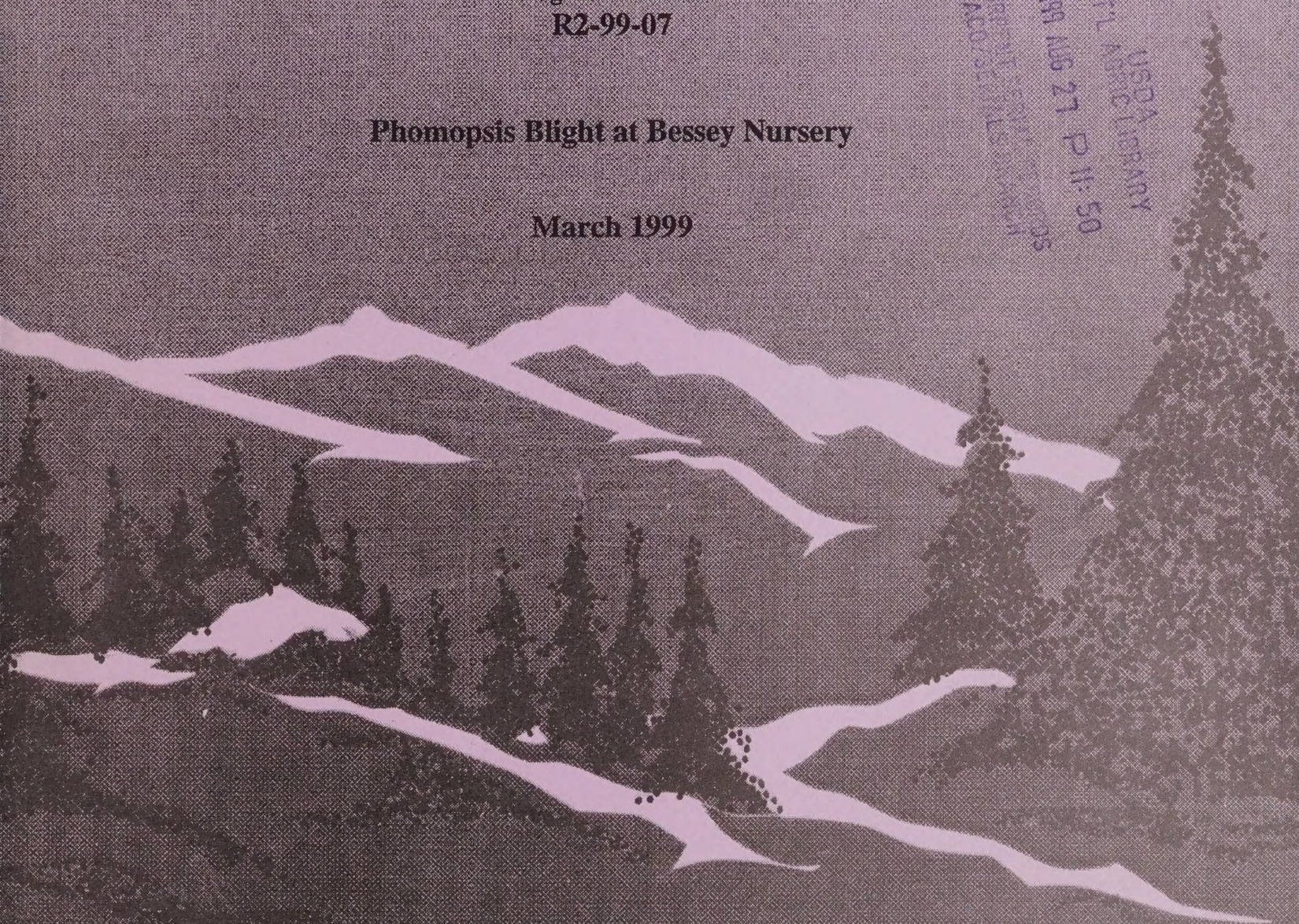
Forest Health Management

Biological Evaluation
R2-99-07

Phomopsis Blight at Bessey Nursery

March 1999



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Renewable Resources
Forest Health Management

Forest Service
Rocky Mountain Region
Denver, Colorado

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type of spores, alpha and beta. Alpha spores are clear, non-distinct, spherical spores. Beta spores are slender, needle-like spores. Both spore types occur as tendrils or coils exuding from the pycnidia and are distributed by water movement. *P. juniperovora* spores are resilient and remain viable even after drying. As soon as climate and environmental conditions become right for spore development, the spores germinate and infect new host tissues. Optimal conditions for spore gemination are at 100% humidity, for 7 hours, at 75° F (Peterson 1986).

The fungus infects and kills new foliage when it is still in its "light green" stage. Young trees are especially vulnerable to this fungus. A total crop loss is possible with first year seedlings and extensive crop loss may occur in second year seedlings. Sometimes the disease seems to be exacerbated late in the growing season as a late flush of new growth occurs to the seedlings (Otta et al. 1980).

Outplantings of infected trees, even slightly infected trees, are not promising (Peterson and Hodges 1989). The infected branches of the seedlings will reinfect the small tree again causing further damage and increase the likelihood of mortality (Hodges and Green 1961).

Mature trees in shelterbelts and landscape plantings may also become infected, but will probably only exhibit some dead branch tips since the fungus can only girdle small branches. Rarely will the disease kill mature trees but the dead branch tips may cause the plantings to look unsightly. These dead branch tips may also act as inoculum sources for the spread of the disease to younger trees (Peterson 1986; Anderson et. al. 1980).

Management for the disease consists of a combination of fungicide treatments, cultural practices, and using resistant seed sources (Peterson and Otta 1979). Systemic fungicides which translocate to new, vulnerable foliage are recommended. Benomyl and thiophanate fungicides have yielded good results when used every 7 - 10 days during the growing season (Otta 1973; Fiedler and Otta 1979; Otta et al. 1980). However, many of these fungicides are not currently listed for use with *P. juniperovora.*

Perhaps the best control method for nurseries is to remove infected seedlings as soon as the symptoms become evident. In the Great Plains region, seedlings should be closely monitored for this disease. Rogueing diseased seedlings when the foliage is dry reduces inoculum levels in the seedbeds and helps prevent healthy seedlings from being infected (Peterson 1986).

Reducing moisture on the foliage helps reduce outbreaks of the disease. Juniper seed beds should be located in well-drained soils to lower the available water to fungal spores. If shading frames are used for the seedlings, then the frames need to be removed in a timely manner to allow the foliage to dry before evenings (Anderson et. al. 1980).

Studies have shown that there can be disease resistance among different seed sources of juniper (Peterson 1984). Provenance plantings indicate that certain seed sources grow well in the Great Plains despite the presence of *P. juniperovora* in the area. Some of the most resistant seed sources for eastern redcedar have been found in central Nebraska (Schaefer 1995).

When large outbreaks of Phomopsis blight occur in a nursery, critical analysis of fungicide use, cultural practices, and the seed sources should be planned. This analysis will help nursery managers find better methods and materials to improve the nursery's production of juniper seedlings.

1998 Phomopsis blight outbreak at Bessey Nursery

The spring and early summers of 1997 and 1998 were cool and wet, with above average rainfall during the months of May through July. This type of weather has been shown to promote Phomopsis blight outbreaks in nurseries by providing a higher humidity which encourages spores to germinate (Schoeneweiss 1969).

Bessey Nursery managers started noticing problems with the fungus in May of 1998. They immediately started regular fungicide applications using Bravo® and Cleary 3336®. Nursery workers started rogueing the infected seedlings from the beds when the trees were dry, disposing of the infected material into plastic garbage bags for removal from the field. It is estimated that the nursery lost approximately 250,000 seedlings in 1998.

Nursery managers were also suspicious about the mature trees in shelterbelts near the seed beds as inoculum sources. FHM was asked to review literature on the disease and identify the disease in shelterbelts to help determine if cedars should be removed. Dr. Glenn W. Peterson, a retired USDA Forest Service Research plant pathologist who worked extensively with Phomopsis blight, visited Bessey Nursery in October. Dr. Peterson helped assess the damage to the seed beds, clarified the identification of disease signs and symptoms, and offered possible solutions including fungicide and cultural control practices. His assistance was greatly appreciated.

With the amount of trees rogued from the beds and the customers' rejection of several trees suspected of the infection, the nursery lost approximately 75% of its 1998 crop due to Phomopsis blight.

Methods

Much of Bessey Nursery's fields are planted with eastern redcedar and Rocky Mountain junipers. Fields 1,2,4,5,6, and 7 (Figure 1) all contain beds of newly sown, one year old, or two year old seedlings. Collections of infected and dead seedlings were made from each field containing one and two year old seedlings. The collected seedlings were used for culturing and pathogen identification/confirmation.

All of the mature juniper within shelterbelts surrounding the nursery were closely examined for evidence of the disease. Surrounding forest trees within 50 feet of the nursery beds along the southern edge of the nursery were also examined. Dead branch tips that appeared to be infected with *P. juniperovora* were cut from every 10th juniper tree in the shelterbelts and forest edge for culturing.

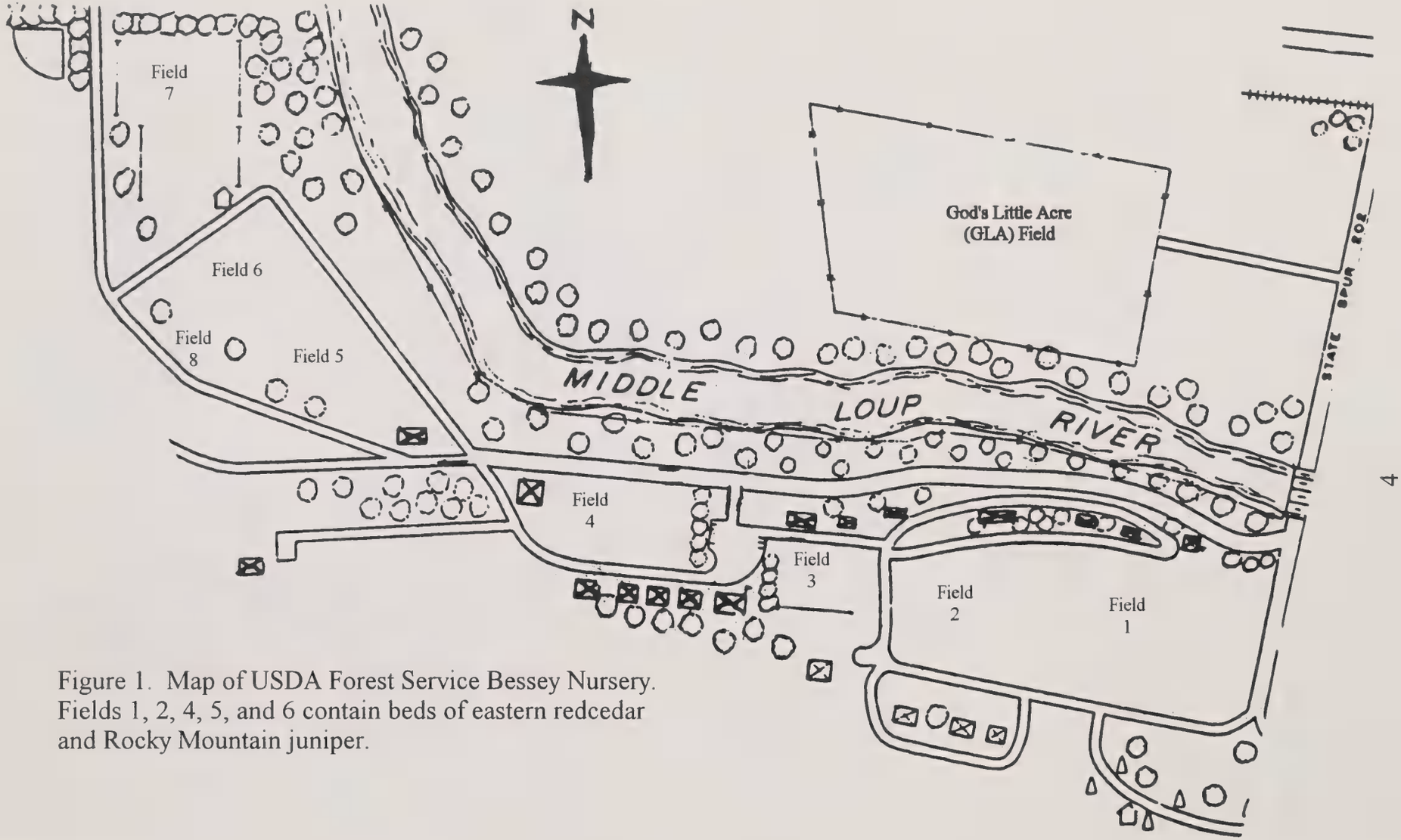

Figure 1. Map of USDA Forest Service Bessey Nursery. Fields 1, 2, 4, 5, and 6 contain beds of eastern redcedar and Rocky Mountain juniper.

Culturing of suspect foliage was used for identification of the pathogen. Field specimens were brought indoors and rinsed with water to remove soil and other possible contaminants. The rinsing was also used to encourage sporulation from the pycnidia. Spores and infected host tissue were cultured on several potato dextrose agar petri plates. If cultures grew into bright yellow colonies, a characteristic of *P. juniperovora* culture (Peterson and Hodges 1989), this was accepted as confirmation of the fungus. Cultures were also magnified at 100X and examined for alpha and beta spores of *P. juniperovora.*

Results and Discussion

Of the culture work, 8 of 50 plates had bright yellow colonies and appeared to be *P. juniperovora.* The disease was found in Fields 1, 5 and 6. Phomopsis was also found in shelterbelts on the northern and western edges of Field 6 and 8 and in the shelterbelt on the eastern edge of field 3. An abundance of alpha spores were found, but no beta spores were observed. This was not surprising since Peterson 1973 reports few beta spores were found from field specimens.

Very little study has been done on how far spores from infected host tissue can travel during rain storms or overhead irrigation, so it is unknown how far away plantings of juniper should be to prevent infection to the nursery beds. Mature junipers from the surrounding shelterbelts probably ought to be removed prior to spring rainstorms and before new growth starts on the seedlings.

While the fungus was identified in these fields and shelterbelts, it probably occurs throughout most of the nursery and adjacent forest lands at low, endemic levels. Perhaps the cool, wet springs for two years promoted an outbreak of the disease in 1998. Early applications of fungicides as seedlings produce new, susceptible foliage should help prevent outbreaks. Possible good systemic fungicides, besides the two previously used by Bessey Nursery, are Bannor® and Chipco® (an epiodione). Close monitoring of seedbeds, and immediate rogueing of infected seedlings when they are dry will help reduce the spread of the fungus throughout the Nursery. Evaluations of seed sources and outplanting successes will provide useful information to nursery managers for possible genetic control measures for Phomopsis blight disease.

Recommendations

- Monitor disease spread in the nursery beds and follow with immediate rogueing of infected seedlings when the foliage is dry.
- Implement an active fungicide program as soon as new growth appears in the spring and continuing throughout the growing season at weekly intervals.
- Remove cedar from shelterbelts near the nursery beds. Consider removal of all mature junipers within 50 feet of the nursery beds.
- Evaluate seed source susceptibility to the disease and outplantings to identify superior seed sources for future disease resistance.

FHM will assist with as many of these recommendations as needed.

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